UNIVERSITI TEKNOLOGI MARA

PIC CONTROLLED INDUCTION HEATING USING RESONANT TECHNIQUE

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CANDIDATE'S DECLARATION

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ABSTRACT

An induction heating controller circuit based on resonant technique is presented. The controller is developed using Peripheral Interface Controller (PIC) chip and Insulated Gate Bipolar Transistor (IGBT) as the main switching devices. The performance of circuit is compared in terms of power losses occur in the main power switching devices. PSpice simulation software is used to simulate and evaluate the circuit performance. Hard switching and soft switching techniques are also investigated. From the simulation results obtained, the best circuit topology and switching technique are selected and implemented using the Peripheral Interface Controller (PIC) chip as main controller. The laboratory model of the system is developed and tested as a portable cooker powered with DC power supply. The performance of the portable cooker is compared with the conventional hot plate technique. The proposed system is also applicable with AC power supply. Simulation results with an AC supply show the proposed technique is able to produce high frequency output current with less harmonics distortion injected back to the AC supply.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

Power electronics is applied for such diverse applications as AC and DC motor drives, switching mode power supplies (SMPS), uninterruptible power supplies (UPS), lighting, heating control and etc. Typical applications of power electronics include conversion of AC to DC, DC to AC, unregulated DC voltage to regulated DC voltage and conversion of a power source from one amplitude and frequency to another amplitude and frequency.

Power electronics involves applications of circuit theory, control theory, electronics, electromagnetics, microprocessor and high-voltage system. Advances in semiconductor switching capability combined with the desire to improve the efficiency and performance of electrical devices make the power electronics a fast growing area in electrical engineering.

One of the applications of power electronics is in induction heating system. Induction heating has been used to heat electrically conductive material since the early 1990's. Induction heating is an efficient, easily controlled method for heating of conductive objects in the processes such as metal hardening or annealing. Industrial applications of the technology include metal melting and heat treating, crystal growing, semiconductor wafer processing, high speed sealing, packaging and curing organic coatings. Induction heating has been widely applied to many kinds of cookware such as rice cookers. It is because induction heating has high heating–efficiency, rapid temperature control, safety and ease of utensil cleaning [1]-[4].